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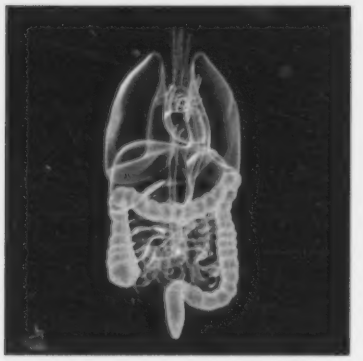
Colorectal cancer testing in Canada–2008



by Kathryn Wilkins and Margot Shields

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Colorectal cancer testing in Canada–2008

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Abstract

Objectives
This article provides estimates of the reported level of colorectal cancer (CRC) testing in the Canadian population aged 50 or older in 2008.

Data sources and methods
The data are from the 2008 Canadian Community Health Survey. With weighted data, the percentage of people who had undergone CRC testing (fecal occult blood test in the past two years or endoscopy within the past five years) was estimated. Bivariate and multivariate analyses were used to examine testing status in relation to personal, socio-economic and other health-related characteristics.

Results
In 2008, an estimated 40% of Canadians aged 50 or older reported that they had had CRC testing. The percentage ranged from 28% in Quebec to 53% in Manitoba. Testing was associated with being 65 or older, higher income, having a regular doctor, being a non-smoker, and being physically active.

Interpretation
Organized CRC screening was limited in 2008, but may account for some of the differences in participation among the provinces.

Keywords
colonoscopy, colorectal neoplasms, endoscopy, fecal occult blood test, mass screening, sigmoidoscopy

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As a group, cancers of the colon and rectum constitute the third most common cancer in Canadian adults.[1] An estimated 22,000 new cases will be diagnosed in 2009–about one in eight of all new cancers that year. Approximately 94% of colorectal cancers (CRC) are diagnosed in people aged 50 or older. CRC is also important as a cause of death; in 2009, it will lead to the deaths of an estimated 9,100 Canadians, making it the second-leading cancer-related cause of death. Since 1990, age-standardized mortality rates have fallen somewhat in both sexes.[1]

Accumulating evidence indicates that the fecal occult blood test (FOBT) reduces the CRC mortality rate.[2-6] If approximately 70% of Canadians aged 50 to 74 had a biennial FOBT, followed up by colonoscopy for positive FOBTs, the CRC mortality rate could be reduced by an estimated 15% to 17%.[5,7] Detailed information on the strengths and limitations of FOBT and endoscopy is available in a previous report.[8]

Several Canadian organizations have issued colorectal screening recommendations over the past few years (Text Box 1). Although details differ slightly, a common, fundamental recommendation is that people aged 50 or older who are at average risk of CRC (that is, without bowel disease or a family history of CRC) should have an FOBT at least biennially. Colonoscopy is the usually recommended follow-up procedure of a positive FOBT.

Organized screening programs, such as those for breast cancer, are aimed at all people in specific target groups; the opportunity for screening does not depend entirely on physician contact.[9,10] In most parts of Canada, CRC screening is currently offered by physicians to patients individually and opportunistically, rather than through population-based organized screening programs. Barriers to implementing organized CRC screening programs may include: uncertainty about the cost-effectiveness of mass screening; the high percentage of false-positive results of FOBT;

concerns about resource availability for follow-up of positive FOBT results or treatment of newly diagnosed cases; potential to miss cancers; and patient non-compliance.[2,8,11-16]

In 2007, Ontario initiated a province-wide organized CRC screening program; Manitoba launched the pilot phase of such a program in the Winnipeg and Assiniboine Regional Health Authorities; and Alberta issued new CRC screening clinical practice guidelines together with a public and professional educational campaign.[17-19] In all three provinces, biennial FOBT is recommended for people of average risk of CRC. Ontario's guidelines include those aged 50 or older, while Manitoba and Alberta target people aged 50 to 74.

Previous research related to CRC screening in Canada has been limited; population-based data have been collected only for specific provinces or sub-provincial regions.[20-23] From these data it was not possible to estimate the extent to which Canadians across the country were participating in CRC screening.

Some findings from the previous Canadian data are consistent with those from studies in the United States. These included positive associations with income and with having a regular physician.[21,24-26]

Nationwide information on CRC testing was collected for the first time by the 2008 Canadian Community Health Survey (CCHS). Using the data from that survey, this study provides estimates of up-to-date CRC testing for any purpose (screening or diagnosis) in Canadians aged 50 or older. Up-to-date testing is defined as an FOBT in the past two years, or a colonoscopy or sigmoidoscopy in the past five years.

Personal characteristics, socio-demographic factors and other health-related risk factors are examined in relation to CRC testing status. Differences by province are presented for 2008, and where possible, estimates based on the 2003 and 2005 CCHS are also provided.

Text Box 1
Recommendations and guidelines on colorectal cancer screening for asymptomatic persons of average risk

Organization (year recommendations/ guidelines issued)	Recommendations/Guidelines
Canadian Task Force on Preventive Health Care (2001)[27]	• Good evidence to include annual or biennial FOBT in periodic health examination of people older than 50. • Fair evidence to include flexible sigmoidoscopy.
National Committee on Colorectal Cancer Screening (2002)[28]	• Biennial (at least) FOBT for people aged 50 to 74. • Follow-up of positive FOBT by colonoscopy, with options of barium enema and flexible sigmoidoscopy, where appropriate.
Canadian Association of Gastroenterology and the Canadian Digestive Health Foundation (2004)[29]	• Biennial FOBT for people aged 50 or older. • Follow-up of positive FOBT with colonoscopy. • Flexible sigmoidoscopy every five years, or • flexible sigmoidoscopy combined with FOBT every five years, or • double contrast barium enema every five years, or • colonoscopy every 10 years.
Canadian Cancer Society (2008)[30]	• Biennial (at least) FOBT for people aged 50 or older. • Follow-up of positive FOBT with colonoscopy, or double contrast barium enema and flexible sigmoidoscopy.

Methods

Data source

The data are from the 2003, 2005 and 2008 Canadian Community Health Survey (CCHS). Along with information on personal, socio-economic and other health-related characteristics, data on CRC testing (FOBT and endoscopy) were collected.

The CCHS is cross-sectional and covers the non-institutionalized household population aged 12 or older in all provinces and territories, except members of the regular Canadian Forces and residents of Indian reserves, Canadian Forces bases (military and civilian) and some remote areas. In 2008, the overall response rate was 75.2% (sample size 66,013); in 2005, it was 78.9% (sample size 132,947); and in 2003, 80.6% (sample size 135,573). A technical description of the CCHS methodology is available in a published report.[31]

The 2008 data were collected from January to December. This analysis was limited to people aged 50 or older, 62% of whom were interviewed by telephone, and the remaining 38%, in person. Of a total of 32,298 respondents in this age range, 30,835 provided information on their experience with FOBT, colonoscopy or sigmoidoscopy and thus comprised the study sample.

Measures

Colorectal investigation

FOBT: "An FOBT is a test to check for blood in your stool, where you have a bowel movement and use a stick to smear a small sample on a special card. Have you ever had this test?" (Yes/No) "When was the last time?" (Less than 1 year ago/1 year to less than 2 years ago/2

years to less than 3 years ago/3 years to less than 5 years ago/5 years to less than 10 years ago/10 or more years ago).

Endoscopy: "A colonoscopy or sigmoidoscopy is when a tube is inserted into the rectum to view the bowel for early signs of cancer and other health problems. Have you ever had either of these exams?" (Yes/No) "When was the last time?" (Less than 1 year ago/1 year to less than 2 years ago/2 years to less than 3 years ago/3 years to less than 5 years ago/5 years to less than 10 years ago/10 or more years ago).

Three measures of colorectal testing were used for this study: FOBT in the past two years; endoscopy (colonoscopy or sigmoidoscopy) in the past five years; and either FOBT in the past two years or endoscopy in the past five years. A respondent who reported FOBT and also endoscopy was counted as having had each procedure. For the combination variable, a respondent reporting both FOBT and endoscopy was counted once.

Census Metropolitan Area

As defined by Statistics Canada, a Census Metropolitan Area (CMA) is formed by one or more adjacent municipalities centred on a large urban area. To be included in the CMA, municipalities must have a high degree of integration with the central urban area, as measured by commuting flows derived from census place of work data.[32]

Household income

Household income groups were derived by calculating the ratio between total household income from all sources in the 12 months before the 2008 CCHS interview and Statistics Canada's low-income cut-off specific to the number of people in the household, the size of the community, and the survey year. Using the entire weighted 2008 CCHS data file, the adjusted income ratios were grouped into quintiles (five groups, each containing one-fifth of the Canadian household population).

Leisure-time physical activity

Three levels of leisure-time physical activity were used, based on information from respondents on their participation in physical activities in the three months before their interview. Levels were defined in terms of activity-specific kilocalorie expenditure per kilogram per day (KKD): active (3 or more KKD), moderate (1.5 to 2.9 KKD), and inactive (less than 1.5 KKD).

Body mass index

Body mass index (BMI) is a measure of weight adjusted for height. It is calculated by dividing weight in kilograms by height in metres squared. The CCHS collected self-reports of height and weight, from which BMI was calculated for each respondent. BMI was categorized as:

- Underweight: less than 18.5
- Normal: 18.5 to less than 25.0
- Overweight: 25.0 to less than 30.0
- Obese class I: 30.0 to less than 35.0
- Obese class II: 35.0 to less than 40.0
- Obese class III: equal to or greater than 40.0

Analytical techniques

Based on data weighted to be representative of the Canadian household population aged 50 or older in 2008, frequencies and cross-tabulations were produced. Logistic regression was used to estimate unadjusted odds ratios for each independent variable in relation to having undergone CRC testing (FOBT in the past two years or endoscopy in the past five years). Multiple logistic regression modeling was used to assess changes in the associations observed in the unadjusted analysis when the influence of selected independent variables was controlled for. These variables included socio-demographic characteristics, having (and contacting) a regular medical doctor, self-perceived health, and health-related risk factors. Variance was estimated using the bootstrap technique to account for the complex design of the survey.[33,34]

Results

The weighted analysis sample represented 10.2 million people aged 50 or older living in households in 2008 (Table 1). An estimated 62% of them were aged 50 to 64, and 71% were married or living in common-law relationships. Nearly two-thirds (66%) resided in Census Metropolitan Areas (CMAs). One in four (26%) had been born outside Canada, and 5% had immigrated less than 20 years ago. Relatively few people aged 50 or older (8%) reported that they did not have a regular medical doctor. Almost one in five (19%) said that their general health was fair or poor.

In 2008, an estimated 40% of Canadians aged 50 or older reported that they had had CRC testing—that is, a FOBT in the past two years or sigmoidoscopy or colonoscopy in the past five years (Table 2). The likelihood of testing was not significantly different between the sexes. Higher proportions of people aged 65 or older had been tested, compared with those aged 50 to 64. The percentage tested was higher among those who were married, and among those living in a CMA. Immigrants who had been in Canada less than 20 years were less likely than people born in Canada to have had CRC testing. People in households with income in the two lower quintiles were less likely to have been tested than were those in higher-income households.

The likelihood of CRC testing was highest (44%) among people with a regular medical doctor whom they had consulted in the past year. Percentages were lower for those with a regular doctor but whom they had not consulted in the past year (29%), and those without a regular doctor but who had consulted a doctor (21%). People without a regular doctor and who had not consulted a doctor in the past year were the least likely to have had CRC testing (10%). A higher proportion of people who perceived their general health to be fair or poor had had CRC testing, compared with those in better health.

Among the small percentage (8%) of people who did not have a regular doctor,

Table 1
Selected characteristics of study sample, household population aged 50 or older, Canada, 2008

	Sample size	Estimated number ('000)	Percentage
Total	**30,835**	**10,172**	**100.0**
Sex			
Male	13,171	4,853	47.7
Female	17,664	5,319	52.3
Age group			
50 to 64	16,506	6,269	61.6
65 to 74	7,667	2,278	22.4
75 or older	6,662	1,625	16.0
Marital status			
Married/Common-law	17,703	7,154	70.5
Widowed	6,083	1,209	11.9
Divorced/Separated	4,292	1,119	11.0
Never married	2,681	671	6.6
Missing	76	..	..
Resides in Census Metropolitan Area (CMA)			
Yes	13,445	6,714	66.0
No	17,390	3,459	34.0
Place of birth			
North America	25,473	7,436	75.0
Europe	3,326	1,310	13.2
Africa	180	149	1.5
Asia	772	735	7.4
Other	382	286	2.9
Missing	702	..	..
Years since immigration			
0 to 9	174	172	1.7
10 to 19	394	358	3.6
20 or more	4,323	2,019	20.4
Non-immigrant	25,206	7,352	74.3
Missing	738	..	..
Household income quintile			
1 (lowest)	6,254	1,842	21.8
2	5,591	1,802	21.3
3	4,679	1,589	18.8
4	4,277	1,536	18.1
5 (highest)	4,442	1,695	20.0
Missing	5,592	..	..
Has regular MD?—Contacted GP/family doctor in past year?			
Yes—Yes	24,817	8,239	81.1
Yes—No	3,359	1,073	10.6
No—Yes	1,225	411	4.0
No—No	1,397	438	4.3
Missing	37	..	..
Self-perceived general health			
Excellent/Very good	14,270	4,883	48.1
Good	10,252	3,388	33.4
Fair/Poor	6,239	1,882	18.5
Missing	74	..	..

.. not applicable
Note: Excludes 1,463 respondents with missing value for colorectal cancer screening.
Sources: 2008 Canadian Community Health Survey.

the likelihood of having CRC testing was estimated according to where they usually go for health care. The percentage who reported that they had been tested was 29% for those who usually seek care at a community health clinic or Centre Local de Services Communautaires (CLSC), 27% for those who go to an appointment clinic, and 13% for those who use a walk-in clinic (data not shown).

The likelihood of CRC testing differed by the presence of health risk factors. Daily smokers were much less likely to have been tested than were non-smokers, and physically inactive people were less likely than were those who were more active. Compared with people whose self-reported height and weight placed them in the normal range of the body mass index (BMI), those in BMI obese class I were more likely to have undergone CRC testing. People classified as underweight or obese class III were less likely to have participated in CRC testing than were those of normal BMI.

Most of the associations with CRC testing observed in the bivariate analyses (Table 2; unadjusted odds ratios in Table 3) persisted in a multiple logistic regression model (Table 3, adjusted odds ratios).

Geographic differences in the percentage of people who had had CRC testing were substantial, ranging from 28% in Quebec to 53% in Manitoba (Figure 1). In general, the likelihood of testing was lower in provinces east of Ontario and in the territories than elsewhere, and markedly higher in Manitoba and Ontario.

Geographic variations were also observed in the percentages of people who had undergone each type of CRC investigation. FOBT in the past two years was less likely among residents of Quebec and the Atlantic provinces, and more likely in Ontario and Manitoba—ranging from 10% in Quebec to 42% in Manitoba (Appendix Table A). Less variation across jurisdictions was observed for endoscopy in the past five years, which ranged from 11% in Yukon to 30% in Ontario. In Quebec, Newfoundland and Labrador, and New

Table 2
Percentage reporting having fecal occult blood test in past two years or colonoscopy or sigmoidoscopy in past five years, by selected characteristics, household population aged 50 or older, Canada, 2008

	Percentage	95% confidence interval	
		from	to
Total	39.8	38.8	40.8
Sex			
Male	40.2	38.8	41.6
Female†	39.5	38.2	40.7
Age group			
50 to 64†	36.5	35.2	37.8
65 to 74	48.6*	47.0	50.3
75 or older	40.2*	38.2	42.1
Marital status			
Married/Common-law†	41.3	40.2	42.5
Widowed	37.0*	34.9	39.2
Divorced/Separated	37.1*	34.3	39.9
Never married	32.8*	29.7	35.8
Resides in Census Metropolitan Area			
Yes†	40.4*	39.0	41.7
No	38.7	37.6	39.7
Place of birth			
North America†	40.1	39.1	41.1
Europe	44.3*	41.7	46.9
Africa	46.2	34.9	57.5
Asia	29.6*	24.5	34.6
Other	37.5	28.7	46.4
Years since immigration			
0 to 9	22.2*‡	12.1	32.3
10 to 19	32.2*	24.9	39.5
20 or more	42.8	40.0	45.5
Non-immigrant†	39.9	39.0	40.9
Household income quintile			
1 (lowest)	35.1*	33.0	37.2
2	38.4*	36.2	40.6
3†	42.4	40.0	44.8
4	42.1	39.7	44.6
5 (highest)	43.3	40.7	45.8
Has regular MD?—Contacted GP/family doctor in past year?			
Yes—Yes	43.7*	42.6	44.8
Yes—No	29.3*	26.5	32.1
No—Yes	21.0*	17.0	24.9
No—No†	9.5	6.7	12.3
Self-perceived general health			
Excellent/Very good†	39.5	38.1	40.9
Good	38.1	36.4	39.8
Fair/Poor	43.6*	41.4	45.9
Smoking status			
Daily smoker	30.1*	27.9	32.3
Occasional smoker	37.5	30.9	44.0
Non-smoker†	41.6	40.5	42.7
Leisure-time physical activity level			
Active (3 or more KKD)†	44.0	41.8	46.1
Moderately active (1.5 to 2.9 KKD)	43.4	41.6	45.3
Inactive (less than 1.5 KKD)	36.6*	35.3	37.9
BMI category			
Underweight (less than 18.5)	32.2*	25.7	38.6
Normal weight (18.5 to less than 25.0)†	39.0	37.5	40.6
Overweight (25.0 to less than 30.0)	40.5	38.9	42.0
Obese class I (30.0 to less than 35.0)	42.7*	40.0	45.4
Obese class II (35.0 to less than 40.0)	43.0	38.1	47.8
Obese class III (40.0 or more)	32.5*	26.7	38.3

† reference category
* significantly different from reference category ($p < 0.05$)
‡ use with caution (coefficient of variation 16.6% to 33.3%)
KKD, kilocalories per kilogram per day
Source: 2008 Canadian Community Health Survey.

Brunswick, higher percentages of people had undergone endoscopy in the past five years than had participated in FOBT in the past two years; in Manitoba, British Columbia and Yukon, the opposite was true.

Comparisons over time showed that in Newfoundland and Labrador, New Brunswick and Ontario, the percentage of people reporting having had an FOBT in the past two years and the proportion having had endoscopy in the past five years increased significantly from 2005 to 2008 (Appendix Table B). Between 2003 and 2008, the percentages tested increased significantly in British Columbia. Data for years before 2008 were unavailable for Quebec, Manitoba, Saskatchewan and Alberta. For Nunavut, sample sizes were too small to produce reliable estimates.

Discussion

This study provides the first national estimates of the percentage of Canadians reporting CRC testing—defined as FOBT in the past two years or endoscopy in the past five years. As of 2008, 40% of people aged 50 or older, the age range in which the incidence of CRC increases rapidly, reported up-to-date testing.

It was not possible to limit the analysis to people at average risk of CRC (see *Limitations*). As a result of the inclusion of people at higher risk, who would likely be undergoing CRC testing more frequently than is recommended for those of average risk, the estimated percentage of the population having CRC testing is probably slightly higher than the estimate for screening in the average-risk population would be.

A study based on administrative records in Ontario covering the six-year period 1995 through 2000 found that 20.5% of 50- to 59-year-olds without a previous history of CRC, other bowel disease, or large bowel investigation (FOBT, barium enema, sigmoidoscopy or colonoscopy) were screened (by FOBT, barium enema, or endoscopy) for CRC.[20] This figure is substantially lower than the finding from the CCHS

Figure 1
Percentage reporting having fecal occult blood test in past two years or colonoscopy or sigmoidoscopy in past five years, by province/territory, household population aged 50 or older, Canada, 2008

* significantly different from estimate for other provinces/territories combined
E use with caution (coefficient of variation 16.6% to 33.3%)
F too unreliable to be published (coefficient of variation greater than 33.3%)
Note: See Appendix Table A for 95% confidence intervals.
Source: 2008 Canadian Community Health Survey.

that 38% of the Ontario population aged 50 or older reported CRC testing in 2005. Several factors may have contributed to the higher estimate from the CCHS data: use of the age group 50 or older rather than 50 to 59, use of self-reported data, inclusion of higher-than-average risk persons, and perhaps, a true increase in the percentage of the population tested as of 2005 versus the percentage tested from 1995 to 2000.

The 2008 data collection year is timely for two reasons: a sufficient interval had elapsed for physicians to have implemented screening guidelines published in the early 2000s into clinical practice, and it closely follows the 2007 launch of province-wide organized screening in Ontario and the pilot initiative in Manitoba. The relatively high levels of testing in Manitoba and Ontario may partially be due to the early results of organized screening. The wide provincial variations in CRC testing contrast with rates of participation in mammography, which have become more uniform since the establishment of organized breast cancer screening programs in all provinces.[35]

A distinct advantage of the CCHS is its large sample size, which supports estimates in sub-populations, as well as comparisons of utilization patterns of specific types of CRC testing among the provinces and territories. For example, in Quebec, the percentage of people reporting testing by endoscopy was approximately twice the percentage reporting FOBT; in Manitoba, the reverse was true. Such differences may reflect province-specific preferences for certain testing modalities, the availability of facilities and specialists, or the early effects of population screening initiatives.[13]

Inconsistencies in the protocols guiding CRC screening make comparisons between the United States and Canada difficult. Nonetheless, participation in the United States may be higher than in Canada. According to data for 2006, the percentage of people who reported FOBT in the past (single) year or endoscopy in the past ten years surpassed 50% in every state and 60% in 21 states.[36]

Numerous studies have noted that the proportion of Americans without health insurance who participate in CRC screening is particularly low—a barrier that Canadians do not face.[37,38] But despite universal access to health care services, Canadians in lower-income categories were less likely than those in higher-income categories to report current CRC testing in 2008—consistent with observations from earlier research in Canada and the United States.[21,24,26,27]

In most parts of Canada, CRC testing is available only with a physician's referral or requisition. Therefore, the strong, positive association with having and consulting a medical doctor was expected, and has been previously observed.[21,22,26,39] The CCHS did not ask respondents if their physician had recommended CRC testing, a factor that has also repeatedly been strongly related to current testing.[34,37-43]

Associations between socio-demographic characteristics and CRC testing have also emerged in previous research. Consistent with the finding in the present study, a positive relationship between older age and the likelihood of CRC testing has been reported.[35,42,43] As well, the finding from the CCHS data that urban area of residence was positively related to CRC testing is consistent with American studies.[37,38] Previously reported associations with marital status are less consistent.[39,42] Little evidence exists related to immigrant status in association with CRC testing, although a lower likelihood of CRC testing in people born outside Canada has been reported.[21]

Relatively few studies have examined associations between health-related risk factors and CRC screening, although the positive association between level of physical activity and CRC testing is corroborated by previous Canadian research.[21] The negative relationship

Table 3
Odds ratios relating selected characteristics to reporting fecal occult blood test in past two years or colonoscopy or sigmoidoscopy in past five years, household population aged 50 or older, Canada, 2008

	Unadjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval	
		from	to		from	to
Sex						
Male	1.0	1.0	1.1	1.0	0.9	1.1
Female†	1.0	..	..	1.0	..	..
Age group						
50 to 64†	1.0	..	..	1.0	..	..
65 to 74	1.6*	1.5	1.8	1.6*	1.5	1.8
75 or older	1.2*	1.1	1.3	1.2*	1.1	1.4
Marital status						
Married/Common-law†	1.0	..	..	1.0	..	..
Widowed	0.8*	0.8	0.9	0.8*	0.7	0.9
Divorced/Separated	0.8*	0.7	1.0	1.0	0.9	1.2
Never married	0.7*	0.6	0.8	0.9	0.8	1.1
Resides in Census Metropolitan Area						
Yes	1.1	1.0	1.2	1.0	0.9	1.1
No†	1.0	..	..	1.0	..	..
Province/Territory						
Newfoundland and Labrador	0.8*	0.6	0.9	0.8	0.7	1.0
Prince Edward Island	0.7*	0.6	0.9	0.8	0.6	1.0
Nova Scotia	0.7*	0.6	0.8	0.7*	0.5	0.8
New Brunswick	0.8*	0.7	0.9	0.8*	0.7	0.9
Quebec	0.5*	0.4	0.5	0.5*	0.5	0.6
Ontario	1.9*	1.8	2.1	2.0*	1.8	2.2
Manitoba	1.8*	1.5	2.1	1.9*	1.6	2.2
Saskatchewan	0.9	0.8	1.1	1.0	0.9	1.1
Alberta	0.9	0.8	1.0	0.9	0.8	1.0
British Columbia	0.9*	0.8	1.0	0.8*	0.7	0.9
Yukon	0.6*	0.4	0.9	0.7	0.4	1.0
Northwest Territories	0.6	0.3	1.2	1.6	0.7	3.7
Nunavut	0.3*	0.1	0.8	1.3	0.6	2.8
Year since immigration						
0 to 9	0.4*	0.2	0.8	0.4*	0.2	0.7
10 to 19	0.7*	0.5	1.0	0.6	0.4	0.8
20 or more	1.1	1.0	1.3	0.9	0.8	1.0
Non-immigrant†	1.0	..	..	1.0	..	..
Household income quintile						
1 (lowest)	0.7*	0.6	0.8	0.8*	0.7	0.9
2	0.8*	0.7	1.0	0.8*	0.7	1.0
3†	1.0	..	..	1.0	..	..
4	1.0	0.9	1.1	1.0	0.8	1.1
5 (highest)	1.0	0.9	1.2	1.0	0.9	1.2
Has regular MD?—Contacted GP/ family doctor in past year?						
Yes—Yes	7.4*	5.3	10.4	5.7*	4.0	8.1
Yes—No	3.9*	2.8	5.6	3.0*	2.1	4.4
No—Yes	2.5*	1.7	3.8	2.4*	1.5	3.7
No—No†	1.0	..	..	1.0	..	..
Self-perceived general health						
Excellent/Very good†	1.0	..	..	1.0	..	..
Good	0.9	0.9	1.0	1.0	0.9	1.1
Fair/Poor	1.2*	1.1	1.3	1.3*	1.1	1.5
Smoking status						
Daily smoker	0.6*	0.5	0.7	0.7*	0.6	0.8
Occasional smoker	0.8	0.6	1.1	0.9	0.7	1.2
Non-smoker†	1.0	..	..	1.0	..	..
Leisure-time physical activity level						
Active (3 or more KKD)†	1.0	..	..	1.0	..	..
Moderately active (1.5 to 2.9 KKD)	1.0	0.9	1.1	1.0	0.8	1.1
Inactive (Less than 1.5 KKD)	0.7*	0.7	0.8	0.7*	0.7	0.8
BMI category						
Underweight (less than 18.5)	0.7	0.5	1.0	0.8	0.6	1.2
Normal weight (18.5 to less than 25.0)†	1.0	..	..	1.0	..	..
Overweight (25.0 to less than 30.0)	1.1	1.0	1.2	1.0	0.9	1.1
Obese class I (30.0 to less than 35.0)	1.2*	1.0	1.3	1.1	1.0	1.3
Obese class II (35.0 to less than 40.00)	1.2	1.0	1.4	1.1	0.9	1.4
Obese class III (40.0 or more)	0.8*	0.6	1.0	0.7*	0.5	0.9

† reference category
* significantly different from reference category ($p < 0.05$)
.. not applicable
KKD: kilocalories per kilogram per day
Note: For province/territory, reference group is combined other provinces/territories.
Source: 2008 Canadian Community Health Survey

between smoking and CRC testing has been reported in Canada and the United States,[21,34,39,41] although some inconsistent results have been noted.[42] Evidence of an association between BMI and CRC testing is limited, but the negative association for people in obese class III is consistent with research findings based on medical records in the United States.[34]

Limitations

The study sample was representative of the household population aged 50 or older. Because not all respondents were asked about personal diagnosis or family history of bowel cancer, it was not possible to differentiate those at average risk from those at higher risk, as is common in other studies.[20-24]

The data were self-reported; no independent verification of the information reported by respondents was undertaken. Validity studies comparing patient-reported with physician-recorded FOBT and endoscopy indicate a tendency to overreport these procedures, which results in overestimates of their prevalence.[45,46] It is thus likely that estimates of CRC testing are inflated to some extent.

The degree to which associations between CRC testing and other variables may be affected by reporting error is

What is already known on this subject?

- Just over 90% of colorectal cancers (CRC) are diagnosed in people aged 50 or older.
- Evidence suggests that population screening for colorectal cancer reduces its mortality rate.
- To date, only Ontario has an organized, province-wide screening program; preliminary steps for programs are under way in other provinces.

What does this study add?

- In 2008, an estimated 40% of Canadians aged 50 or older reported up-to-date colorectal cancer testing—that is, a fecal occult blood test in the past two years or endoscopy in the past five years.
- Differences among the provinces and territories in the percentage of the population tested were large.
- The likelihood of CRC testing was greater among people who lived in higher-income households, had a regular doctor, did not smoke, and were active in their leisure time.

unknown. In particular, the accuracy of information about socially sensitive characteristics such as body weight (or perhaps even CRC testing) may be affected.

Data were not collected on all factors that may influence compliance with CRC testing, so they could not be taken into account in the analysis. Subjective factors that have been observed to affect health-related decisions and preventive behaviours have been catalogued under the Health Belief Model. These include perceived susceptibility, perceived seriousness of the condition to be prevented, and perceived benefits of, and barriers to, preventive action.[47,48] In the specific context of CRC testing, the perception of a procedure as unpleasant, invasive or dangerous may hinder compliance.

Conclusion

This study provides new information on current levels of CRC testing in the Canadian population. The data show considerable differences in participation among the provinces and territories. The analysis also indicates that participation in CRC testing varies depending on contact with a physician, and identifiable socio-economic and behavioural characteristics. Continued monitoring of CRC testing in conjunction with CRC incidence and mortality will provide further useful information. ■

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Appendix

Table A
Percentage reporting having colorectal cancer testing, by type of test and province/territory, household population aged 50 or older, Canada, 2008

	Fecal occult blood test (FOBT) in past two years			Colonoscopy or sigmoidoscopy in past five years			FOBT in past two years or colonoscopy or sigmoidoscopy in past five years		
		95% confidence interval			95% confidence interval			95% confidence interval	
Province/Territory	Percentage	from	to	Percentage	from	to	Percentage	from	to
Canada	**22.7**	**21.9**	**23.6**	**24.4**†	**23.6**	**25.3**	**39.8**	**38.8**	**40.8**
Newfoundland and Labrador	15.6*	12.8	18.4	24.8†	21.2	28.3	33.9*	30.0	37.8
Prince Edward Island	18.0*	14.1	21.9	21.3	16.4	26.2	32.3*	27.1	37.5
Nova Scotia	16.3*	13.3	19.3	19.4*	16.8	22.0	31.8*	28.2	35.4
New Brunswick	16.4*	14.1	18.6	24.1†	21.3	27.0	34.5*	31.2	37.8
Quebec	9.7*	8.5	11.0	21.6*†	19.9	23.3	27.7*	25.9	29.5
Ontario	30.5*	28.9	32.2	29.8*	28.2	31.4	49.6*	47.8	51.5
Manitoba	41.9*	38.0	45.7	22.4†	19.2	25.5	53.5*	49.8	57.2
Saskatchewan	22.3	19.6	25.0	23.6	20.9	26.3	38.1	35.1	41.2
Alberta	23.0	20.4	25.5	20.3*	17.9	22.7	37.3	34.5	40.2
British Columbia	23.8	21.8	25.7	19.4*†	17.4	21.4	36.8*	34.6	39.1
Yukon	24.6	17.2	31.9	10.9*†‡	5.8	16.1	28.7*	21.0	36.3
Northwest Territories	18.5‡	7.7	29.3	F	F	F	29.8‡	16.8	42.9
Nunavut	12.0*‡	5.4	18.6	F	F	F	F	F	F

* significantly different from estimate for other provinces/territories combined ($p < 0.05$)
† significantly different from estimate for FOBT ($p < 0.05$)
‡ use with caution (coefficient of variation 16.6% to 33.3%)
F too unreliable to be published (coefficient of variation greater than 33.3%)
Source: 2008 Canadian Community Health Survey

Table B
Percentage reporting having colorectal cancer testing, by type of test, household population aged 50 or older, selected provinces/territories, Canada, 2003, 2005 and 2008

	Fecal occult blood test (FOBT) in past two years			Colonoscopy or sigmoidoscopy in past five years			FOBT in past two years or colonoscopy or sigmoidoscopy in past five years		
	2003	2005	2008	2003	2005	2008	2003	2005	2008
	Percentage			Percentage			Percentage		
Province/Territory									
Newfoundland and Labrador	9.3	10.8	15.6*	18.8	20.4	24.8*	23.8	26.6	33.9*
Prince Edward Island	..	17.8	18.0	..	22.2	21.3	..	33.7	32.3
Nova Scotia	..	12.7	16.3	..	18.2	19.4	..	27.1	31.8*
New Brunswick	..	12.7	16.4*	..	20.1	24.1*	..	27.6	34.5*
Ontario	..	20.7	30.5*	..	24.2	29.8*	..	37.9	49.6*
British Columbia	16.4	..	23.8*	14.7	..	19.4*	26.6	..	36.8*
Yukon	..	18.1‡	24.6	..	13.3‡	10.9‡	..	27.0	28.7
Northwest Territories	..	17.0‡	18.5‡	..	22.3‡	F	..	30.6	29.8‡

* significantly different from estimate for previous time period ($p < 0.05$)
‡ use with caution (coefficient of variation 16.6% to 33.3%)
.. not available
Sources: 2003, 2005 and 2008 Canadian Community Health Survey